

- Fact Sheet -  
The Use of Recycled Tire Materials on Playgrounds & Artificial Turf Fields

**Background**

Ground rubber — also called “tire crumb” or “crumb rubber” — is recovered from scrap tires or from the tire retreading process. It is used in road construction and in a number of athletic and recreational applications, including ground cover under playground equipment, running track material, and as a soil additive on sports and playing fields.

Crumb rubber is often used in artificial turf fields as “infill” between turf fibers to provide stability, uniformity and resiliency to artificial turf fields. Artificial turf was developed in the mid-1960s and has since gained widespread popularity around the country. Synthetic turf was originally used in stadiums and on athletic fields for college and professional sports teams, but now is also used in municipal parks, golf courses, playgrounds, cruise ships, and airports. There is also a growing residential market.

According to the Synthetic Turf Council, artificial turf has been installed in approximately 4,500 U.S. fields, tracks and playgrounds.

**Public Concerns**

Over the past several years, a number of public concerns have been raised over the use of tire crumb materials in turf fields and playgrounds. For example, parents in Colorado were concerned about children carrying home small particles of tire crumbs on their clothing. About this time, high levels of lead were detected on some artificial turf fields in New Jersey.

**EPA Research**

In response to these concerns, EPA developed an Agency workgroup that initiated a limited-scale scoping study to test a study protocol and monitoring methods for generating environmental data associated with the use of recycled tire material on artificial turf fields and playgrounds.

As part of this evaluation, data were collected at a limited number of sites. The full study protocol was implemented at two synthetic turf fields and one playground. Additional samples were collected at four other synthetic turf fields and a second playground. Sampling sites were located in North Carolina, Georgia, Ohio, and Maryland.

It is important to have accurate and reproducible methods for measuring environmental concentrations of the components of synthetic turf fields and playgrounds. The study protocols and the majority of the methods evaluated were found to be appropriate for characterizing concentrations of tire crumb components in the environment.

On average, the concentrations of components monitored in this study were below levels of concern; however, given the very limited nature of this study (i.e., limited number of components monitored, samples sites, and samples taken at each site) and the wide diversity of tire crumb material, it is not possible to extend the results beyond the four study sites or to reach any more comprehensive conclusions without the consideration of additional data.

In reviewing the literature, EPA believes there is no definitive study that fully addresses all of the questions regarding safety considerations associated with the use of synthetic turf and/or crumb rubber fields. As a further complication, characteristics and performance of synthetic grass blades may need to be considered separately from those of crumb rubber infill. However, both the Consumer Product Safety Commission and the Centers for Disease Control recommend that young children wash their hands frequently after playing outside and always before they eat. EPA also recommends these practices.

The results from this scoping study along with results from other studies conducted by Federal, State, and local organizations, such as the Consumer Product Safety Commission (CPSC); Agency for Toxic Substances and Disease Registry; states including New Jersey, Connecticut, California, and New York; and New York City, will be considered by EPA to identify possible next steps to address questions from the public regarding the safety of tire crumb infill in ball fields and playgrounds.

A meeting is being planned for spring 2010 among interested federal and state agencies to share information about possible contaminant levels from tire crumb/synthetic playing surfaces and discuss whether additional research is needed.

### **Key Technical Findings from EPA's Study**

Key technical findings from the EPA scoping study are summarized below. It should be stressed that the fields were selected based on proximity to facilities of EPA's National Exposure Research Laboratory. The results reported here may not be representative of environmental concentrations found at other sites.

- The overall study protocol and many of the methods were found to be appropriate and could be implemented in the field. Several limitations are noted as follows:
  - Collecting integrated air samples provided a high burden in terms of time and equipment.
  - At any single site, there can be substantial variability in the materials used and the concentrations of contaminants measured. More work is needed to determine where to collect samples and how many samples to collect to fully characterize a given site.
  - It was difficult to obtain access and permission to sample at playgrounds and on recreational fields. More work is needed to increase public and private owner participation if additional monitoring studies are to be conducted.
- Methods used to measure air concentrations of particulate matter (PM) and metals were found to be reliable.
  - Concentrations of PM and metals (including lead) measured in air above the turf fields were similar to background concentrations.
  - Concentrations of PM and metals at the playground site with high play activity were higher than background levels.
  - All PM air concentrations were well below the National Ambient Air Quality Standards (NAAQS) for PM (150 micrograms per cubic meter).

All air concentrations for lead were well below the NAAQS for lead (150 nanograms per cubic meter).

- Methods used to measure volatile organic compounds (VOCs) in air were found to be reliable.
  - All VOCs were measured at extremely low concentrations which is typical of ambient air concentrations.
  - One VOC associated with tire crumb materials (methyl isobutyl ketone) was detected in the samples collected on one synthetic turf field but was not detected in the corresponding background sample.
- Methods used to measure extractable metals from turf field blades, tire crumb materials, and turf field wipe samples were found to be reliable. However, the aggressive acid extraction procedure will likely overestimate the concentration of metals that are readily available for human uptake. Since understanding uptake is a key component in understanding risk, methods to determine bioavailable metal concentrations are still needed.
  - Total extractable metal concentrations from the infill, turf blade samples and tire crumb material were variable in the samples collected both at a given site and between sites.
  - The average extractable lead concentrations for turf blade, tire crumb infill, and tire crumb rubber were low. Although there are no standards for lead in recycled tire material or synthetic turf, average concentrations were well below the EPA standard for lead in soil (400 part per million).
  - Likewise the average extractable lead concentrations for turf field wipe samples were low. Although there are no directly comparable standards, average concentrations were well below the EPA standard for lead in residential floor dust (40 micrograms per square foot).

#### **Additional information on the use of recycled tire materials**

In the United States, a number of cities and states have engaged in varying levels of sampling, testing and evaluation of synthetic turf products.

In January 2007, the California Office of Environmental Health Hazard Assessment issued a report, *Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products*. The report concluded that there appeared to be little long-term risk to human health.

However, in August 2007, the Connecticut Agricultural Experiment Station reported the results of a small (\$2,000) study it conducted to evaluate tire crumb. The laboratory concluded that “under relatively mild conditions of temperature and leaching solvent, components of crumb rubber produced from tires (i) volatilize into the vapor phase and (ii) are leached into water in contact with the crumbs.”

In June 2008, the Centers for Disease Control and Prevention issued a low-level public health advisory, due to the extensive publicity surrounding artificial turf. The Consumer Product Safety Commission investigated reports of lead contamination from artificial turf and, in July 2008, concluded that “young children are not at risk from exposure to lead in these fields.”

After a review of the literature, EPA identified a number of compounds or materials that may be found in tires, although not all are contained in every tire:

acetone  
aniline  
arsenic  
barium  
benzene  
benzothiazole  
cadmium  
chloroethane  
chromium  
cobalt  
copper  
halogenated flame retardants  
isoprene  
latex  
lead  
manganese

mercury  
methyl ethyl ketone  
methyl isobutyl ketone  
naphthalene  
nickel  
nylon  
phenol  
pigments  
polycyclic aromatic hydrocarbons  
polyester  
rayon  
styrene-butadiene  
toluene  
trichloroethylene  
zinc